

# New and Emerging Technologies: The Future is Now

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- Energy Supply
- Building Shell
- Lighting
- Occupant Environment
- Transportation

### Energy Supply

- Status Quo
- Renewable Energy
- Fuel Cells

#### Energy Supply: The Status Quo

- Big utilities aren't going away soon
- More and different rate structures
- Real time data and rate structures

#### Energy Supply: Emerging

- More and better utility monitoring and evaluation tools
- Hydrogen generation

#### Energy Supply: Renewables

- Solar thermal
- Photovoltaic
- Wind
- Geothermal
- Biomass
- Exotics

## Energy Supply: Fuel Cells

- Modular & Stackable
- Direct current standard

## Energy Supply: Fuel Cell

- Capture waste heat
  - Heat occupied space
  - Refrigeration
  - Preheat water

## Building Shell

- Traditional construction
- Alternative construction
- New technologies

## Building Shell: Traditional Construction

- Traditional construction styles

## Building Shell: Alternative Construction

- Concrete
- Modular
- Monolithic dome
- Strawboard
- Straw bale
- Earth ram
- Possibilities

## Building Shell: New Technologies

- Responsive roofs
- Dynamic windows

## Lighting

- Daylighting

- T-12
- T-8, 5, 3 and 2
- Compact fluorescent
- Light emitting diodes

## Lighting: Daylighting

- Designed in
- Intelligent design
- Sky lights and tubes

## Lighting: T-12s, Obsolete

- T-12, consider obsolete

## Lighting: T-8/5/3/2 Lighting

- Smaller bulb diameter offers better optical control
- Available in 4 lengths
- Efficacy comparable to T8
- High lumen maintenance
- Lower mercury levels

## Lighting: Sub-Compact Fluorescent

- Rapid market penetration

## Lighting: Light Emitting Diodes

- The future of lighting

## Lighting: LED Applications

- The applications are almost endless

## Occupant Environment

- Intelligent buildings
- Dedicated fuel cells
- Space conditioning
- Indoor air quality

- Occupant services

## Intelligent Buildings: Holistic Designs

- Holistic designs will become the norm

## Intelligent Buildings: Sensors

- Everything will be sensed

## Intelligent Buildings: Communications

- The joke's on us - smart appliances are coming
- They talk

## Occupant Environment: Fuel Cells

- Install most anywhere
- Quiet
- Maintenance free
- Waste heat recovery

## Occupant Environment: Portable Fuel Cells

- Fuel cells as common as batteries

## Occupant Environment: Indoor Air Quality

- Desiccant systems controlling humidity
- Diverse air quality sensors
- Intelligent indoor air quality management
- Soon obsolete

## Occupant Appliances

- Convergence is happening
- Smart appliances

## Occupant Telecom

- More bandwidth
- More wireless
- More connected

## Occupant Entertainment

- Technology drives us
- Entertainment drives technology

## **Transportation**

- More intelligent vehicles
- More energy efficient

### Transportation: Mass Transit

- Rapid transit
- More efficient vehicles
- Smarter/safer vehicles
- Fuel cell powered vehicles

### Transportation: New Technologies

- Micro and nano systems

### Transportation: Micro Heat Exchanger

- Use in Heat Pumps or Air Conditioners
- Shoebox size
- Eliminate distribution losses

## Transportation: Gas Phase Combuster

- Use in Fuel Cells
- Hydrogen reformers
- Convert fuel to electricity and waste heat to power micro-scale heat pumps

## Transportation: Gasoline Vaporizer

- Increases fuel efficiency
- Reduced emissions

## Transportation: Vehicle Air Conditioning

- Heat pumps
- Powered by heat

## Transportation: Smarter/Safer Vehicles

- Dynamic mirrors and windows
- More communications
- More computers
- Electrical replacing mechanical systems

## Fuel Cell Vehicles: Buses

- Today very common

## Fuel Cell Vehicles: Automobiles

- Early adopter versions available in 2007
- Common by 2012

## Fuel Cell Vehicles: Services

- Service vehicles

## Fuel Cell Vehicles: Recreation

- Recreational vehicles

## Summary: New & Emerging Technologies The Future

- Imagine future buildings
- New technologies are pushing us
- Emerging technologies will change the world
- Watch
  - Fuel cells
  - Entertainment
  - Information appliances
  - Micro and nano technologies
  - The hydrogen revolution

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